FAA GENERAL AVIATION NEWS

OCTOBER 1976

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN

Taildragging without tears

COVER:
Watering stock, Texas style.

FAA GENERAL AVIATION NEWS

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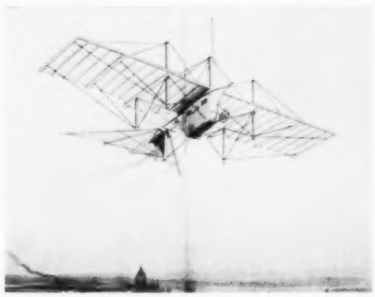

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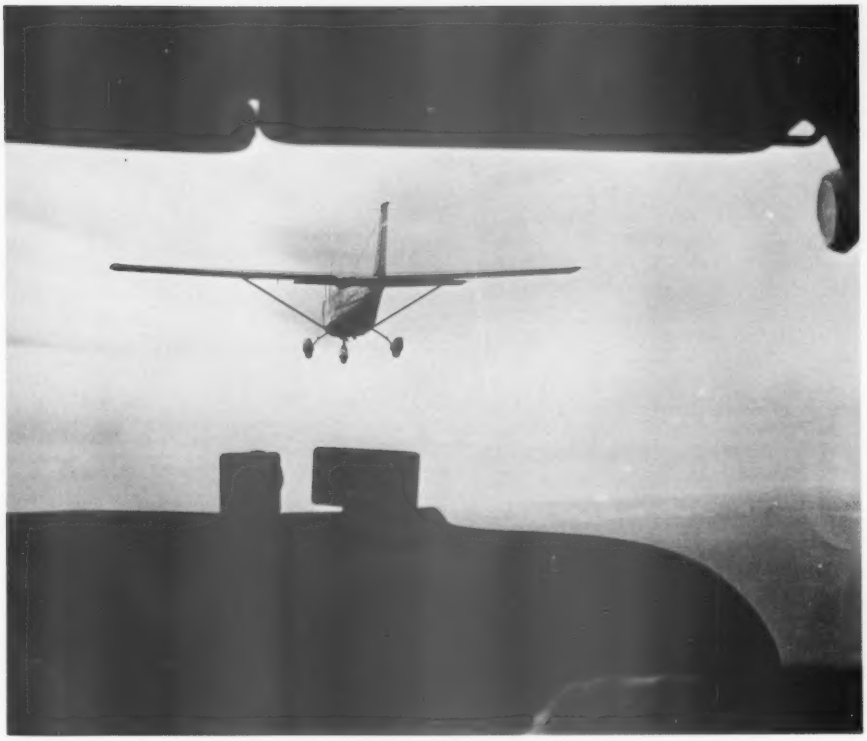
Occupied Airspace



The Cessna pilot ahead might be very surprised to learn that he is not alone in the sky.

The nightmare of all pilots and all persons who travel by air is the midair collision, the most abrupt and deadly of all aircraft accidents. Approximately one out of every two midair collisions involves fatalities. The possibility of such an accident occurring at any time, in any airspace, is something that every pilot must learn to cope with in a manner that best protects his passengers and himself—and his fellow airmen. In 1972, when the National Transportation Safety Board published a review of midair accidents for the three year period 1968-1970, it noted that 78 percent of these accidents *could have been avoided by the see-and-be-seen concept if the aircrews had conformed to the existing flight rules and cockpit procedures established by FAA, and if the aircraft involved had been more conspicuous.*

Poor weather, bad visibility, high traffic density or unusual conditions of flight are not necessarily factors in midair collisions. The greatest number of them take place during daylight, in good visual conditions, and at low closure speeds. Probably the greatest single contributing factor is a tendency to assume the absence of other aircraft in the immediate vicinity, without ascertaining that this is actually the case. In simpler words—not bothering to look.

This same NTSB report noted that the majority of general aviation midair accidents during 1968-1970 (about 63 percent) took place *in the vicinity of airports,* with a smaller proportion occurring en route. Consequently considerable emphasis was placed upon the importance of airman alertness near airports, and upon developing electronic devices to aid in the prevention of midairs.

However, in recent years a different trend in the location of midairs has been observed. Of the 34 general aviation midair accidents in 1974, for example, only 15 (44 percent) took place in or near the traffic pattern. And in 1975 only 40 percent of the general aviation midairs took place close in—virtually a complete reversal of the earlier situation, according to a preliminary count.

The new trend may be due to a reduction of midairs near airports, as a result of emphasizing the frequency of accidents in terminal environment. But it is probably also due to a tendency on the part of some pilots to assume that once they have departed the airport traffic zone they can enjoy the freedom of the skies and boundless space without being concerned about any moving object that may be hidden by the wing or fuselage.

The odds against two aircraft attempting to occupy the same small chunk of airspace at the same time appear to be so great that not all pilots are willing to carry out appropriate measures to prevent it from occurring. Especially on clear, VFR days there is a temptation to relax and watch the world go by—which is a very different thing from active scanning for other aircraft. But the general aviation airman, who takes his responsibilities seriously, scans continually from the moment the flight begins until the engine is shut down and the propeller stops. He learns to do this in a manner that is effective without being stressful, and he is able to relax in the sense that he knows he has reduced the possibility of a midair to an absolute minimum.

A tragic example of what can occur when scanning vigilance is not maintained took place recently in northern Washington state, over wide open terrain in clear weather with visibility unlimited. On November 29, 1974, the day after Thanksgiving, at 12:00 noon two young men took off in a rented Cessna 150 from King County Airport near Seattle for a pleasure flight along the eastern shore of Puget Sound. The pilot was a 20 year old student at South Seattle Community College, enrolled in an aviation technology course: he had been flying for about a year and a half, and had logged 77 hours to date. Earlier that same year he had received his FAA power plant mechanic certificate. Accompanied by a fellow student, he took off without filing a flight plan, so his exact route is unknown, but he appeared to have traveled in a northerly direction for 60 or 70 miles before circling around and heading back toward Seattle. He had signed out the aircraft for a two-hour flight. In the opinion of the fixed base operator he was "a responsible, proficient pilot . . . a thoroughly mature individual."

Approximately 45 minutes after the departure of the rented Cessna 150, an aircraft of this type and model, with identical color marking and two young men on board, landed at a private air strip near Port Townsend, Wash. The field is located on the northeast corner of the Olympic Peninsula, about 45 miles northwest of Seattle. There was, however, no confirmation of the N-number, or identification of the pilot. The aircraft remained at the field only a few minutes.

Shortly afterwards, at approximately 1:30 p.m., a Piper *Cherokee* departed from Bellingham Airport, some 80 miles north of Seattle. On board were a 43 year old flight instructor, with over 8,000 total flight hours, and a 16 year old student who was flying down to Seattle with him to be given some practice at a tower-controlled airport.

Two students and two instructors luckily survived this collision, which took place in Dallas when their blind spots coincided on final approach at an uncontrolled airport. The **Cherokee,** making a steep, close-in approach, descended on top of Cessna, already on final.

No flight plan was filed, but apparently the route followed took them over the eastern shoreline of the Sound. About ten minutes after takeoff the Piper was sighted at an estimated 1,500 to 2,500 feet, about three miles west of Mt. Vernon.

The Cessna 150 arrived at the same point in space at the same time. The ensuing collision took the lives of all four on board.

Written statements regarding the collision were given by three farmers working in the area—and by a nine year old boy who looked up after he heard a loud boom in the sky. The boy told NTSB investigators:

"I was in the back yard playing when a loud boom sounded. I jumped up on a picnic table and saw two planes starting to fall away from one another. Two large objects started falling too, and I thought they were wings. The one [airplane] went quite fast towards the woods [southerly direction] and was spiraling some. The other one [the *Cessna*] seemed to come straight down spiraling quite fast, and when it hit the ground it burst into fire. I then ran in and told my mother and we ran out to the front porch and saw the fire and one wing still floating down."

The three farmers all stated that they saw the planes come together, but their impressions of what actually happened differed considerably. One of the trio, who was working on his barn, about ½ mile east of the collision point, estimated the aircraft were at about 1,500 to 2,000 feet when he noticed them:

"One airplane (later identified in his statement as the *Cherokee*) was southbound straight and level. The other aircraft was 300 to 400 feet above and heading approximately north. I saw the northbound aircraft go into a full dive under power—I could hear it rev up—and pull up and collide with the southbound aircraft. It looked like the northbound aircraft hit the other almost head-on and from underneath. The northbound aircraft came out of the dive maybe 50 feet below the southbound aircraft. The two parted immediately—they did not land together. . . . The southbound plane lost one wing in the collision and it drifted to the west. The Cessna spiraled down slowly and I could not distinguish color of either aircraft or whether they were high or low wing until I saw the southbound plane going in. I could see it was a low wing . . . I did see the Cessna (high wing) as it was coming down."

Some of the evidence gathered from the wreckage appeared to substantiate the view that a head-on collision had taken place, but it was not conclusive, and this view was opposed by the statement of the other two witnesses, who were standing together about ½ mile west of the site. They believed that both planes were flying in a southerly direction and converged on impact:

". . . The Cessna was flying south into the sun, and the *Cherokee* came from the west and possibly a little northwest. The two planes were on the level and approximately 2,500 feet altitude. The *Cherokee* prop hit the Cessna on the right wing, throwing both planes together and the *Cherokee* losing its left wing. The plane came sharply out of the sky and burst (sic) to the ground. The Cessna spiraled back to the north . . . taking about five to six seconds and about five to six spirals. Upon hitting the ground the Cessna fuel tank burst, spreading flames over the cockpit of the airplane and the surrounding area."

On a clear bright day, with no other aircraft around for miles, two small planes came together and four persons died. The exact circumstances leading up to the collision, and the question as to whether one pilot or the other was more to blame, no one will ever know. The NTSB "probable cause" finding stated simply that both pilots in command had failed to see and avoid the other aircraft. The impact site suggests that both aircraft may have been following Victor Airway 21, which runs a direct course between Seattle and Bellingham. Since they were flying VFR below 3,000 feet AGL, the pilots were not bound by the regulation that separates traffic flying in opposite directions by altitude.

Despite the excellent visibility from the cockpit of contemporary light aircraft, certain areas remain blocked out from the pilot's view—notably the area below and forward of the cockpit in a low wing airplane, and above and behind in a high wing plane.

When a low wing airplane is positioned above a high wing plane, there is considerable potential for the wings to block the aircraft from the view of the pilots when converging. While some pilots believe that it is only necessary to "clear the air" when you are preparing to turn or practice some maneuver, many experienced pilots make it a habit to interrupt a straight and level course occasionally to check on their "blind spots" by banking the aircraft appropriately (lowering the wing for a low wing plane and raising it for the high wing). Similarly, when changing altitude they will bank in each direction, looking to make certain the airspace they are moving into is not already occupied.

An airway differs from a highway in this important respect: *you can be overtaken or collided with from beneath or above, as well as from the side.* Despite the great odds against a midair accident occurring, it simply makes good sense never to assume that all the airspace around you is unoccupied, just because you have no visual or or radio knowledge to the contrary. The sophistication of modern aircraft and the airways notwithstanding, the law of self-preservation still operates—sometimes with tragic consequences—in the sky.

(Editor's note: the second part of this article, dealing with specific pilot techniques for collision avoidance, will appear in the following issue.)

Returned to Service

What to look for in the maintenance records before you fly away

"Each owner or operator of an aircraft shall have that aircraft inspected as prescribed . . . and shall, between required inspections, have defects repaired as prescribed. In addition ***he shall ensure that maintenance personnel make appropriate entries in the aircraft and maintenance records*** *indicating the aircraft has been released for service."*

Few aircraft owners would quarrel with the intent of Federal Aviation Regulation 91.165, as quoted above. Who in the name of common sense is more anxious than the owner to make certain that his aircraft is healthy, or to avoid unnecessary repair bills? The question remains: why is it that so many aircraft owners find themselves not in compliance with this rule—particularly with respect to appropriate entries being made in the aircraft and maintenance records?

The owners who are guilty of such laxity can be divided into two classes: (1) Those who never bother to look at the service logs because they assume they can leave such matters to the mechanics, and (2) those who do review the records religiously but do not know what to look for. The first type of offender and the problems he gets into were described in the first half of this article, appearing in the September issue. The present article is intended to shed some light on *the kind of inscriptions you may expect to find in the log, who is authorized to make them, and what these signify.*

To begin at the very beginning, consider the type of preventive maintenance which may be performed by persons other than certified aircraft mechanics. Preventive maintenance is defined as "Simple or minor preservative operations and the replacement of small standard parts not involving complex assembly operations." This is a general description of the kind of work that a certificated pilot is permitted to do on his own aircraft or on one that he flies (unless it is used in air carrier service—and this includes air taxis). This description is subordinate to Appendix A of FAR Part 43, which provides a list of 25 items that are specifically classed as "Preventive maintenance," including such routine chores as changing engine oil, spark plugs, light bulbs or tires, repairing upholstery, checking or replacing batteries, etc.

When this type of maintenance is performed by the pilot he is not required to record it in the "maintenance records, or service logs"—although many pilots find it helpful to do so, especially with items that are to be periodically repeated, such as spark plug or oil changes.

Any work that is done by or under the supervision of a certificated mechanic, is regarded as "maintenance"—not "preventive maintenance"—and an appropriate entry must be made in the aircraft records. The entry should contain a complete description of the work done, the date, and the name of the mechanic. If the latter also signs the entry, his *signature indicates that the aircraft is approved for return to service*, even when no such formal statement is made.

The reasoning behind the maintenance entry requirement is obvious: If the work is done by someone other than the pilot, the latter must have some certain means of knowing that the job has been completed and the airplane is ready to fly. He does not want to discover at altitude that his control cables were not all re-connected, or his engine oil was drained but not fully replenished.

An incident of this nature happened to the owner of a Cherokee Six, who asked the mechanic at his airport to do an oil and filter change for him on Friday afternoon so that he could get off to an early start on a weekend vacation flight bright and early the following morning. The next day at the crack of dawn the pilot and his family arrived at the airport luggage in hand. They found the *Cherokee* parked on the ramp, fully gassed, and apparently raring to go. A check of the oil stick, during the preflight inspection, showed a full supply of clean, fresh oil. So off they went on their flying vacation—which lasted about three minutes. Soon after becoming airborne the pilot observed the oil pressure was dropping off sharply and the oil temperature going up. To save the engine he made an emergency landing in a plowed field, shaking up his passengers somewhat but resulting in no injuries and little airframe damage other than a bent prop.

The really painful part of this experience came during the subsequent accident investigation, when the pilot learned that the mechanic *had not actually completed the oil/filter change.* He had encountered some difficulty tightening the filter as the Friday afternoon drew to a close, and decided that he would get someone to help him do it first thing in the morning—never imagining that a dawn departure had been planned. Since he had not signed off the work in the service log, he was in the clear; no violation could be filed against him, nor could he be held responsible for the damage. The pilot learned, at considerable cost, that it was his responsibility to check the maintenance rec-

ords for written confirmation that the aircraft could be returned to service.

If maintenance is classified as "major," special documentation is also required. In addition to the service log entry the mechanic or repair station must fill out FAA Form 337, "Major Repair and Alteration," in duplicate. One signed copy goes to the owner and the other is sent to the local FAA Flight Standards District Office within 48 hours after the aircraft has been approved for return to service. An FAA Maintenance Inspector in the District Office reviews the description of the work done provided in the form and, if he feels it is advisable, may ask to inspect the work.

If a repair or alteration results in any change in the aircraft operating limitations, such as weight and balance for example, these limitations must be revised to reflect this change. The mechanic has the responsibility to compute the new figures and enter them in the limitations but, again, the owner had the responsibility for seeing that this is actually done. This dual obligation normally ensures accurate recordkeeping for important items of this kind.

Occasionally this dual responsibility is not complied with, endangering the lives of those who fly in the airplane. The consequences of such a lapse of responsibility became apparent during a summer flight to Aspen, Col., in a newly acquired Cessna 182. The owner, who flew out of Denver, had acquired the aircraft in February and arranged for auxiliary fuel tanks to be installed to extend his range. He experienced no difficulty flying the aircraft in winter, usually accompanied only by his wife. But on a return flight from Aspen's airport (field elevation, 7,795 feet) in late June with four on board, he had trouble getting off the ground, and once airborne found the aircraft climbing so slowly that he failed to clear a tree-covered ridge. The occupants all survived the crash with minor injuries, fortunately, but the plane was severely damaged.

The accident investigators found no evidence of engine malfunction, and eventually determined that the poor climb capability was due to a combination of two factors: high density altitude and overloading the aircraft. The pilot had calculated that he would be under maximum gross weight (2,800 lbs. for that model) if each of the four occupants took no more than 50 pounds of luggage or fishing gear. However, the limitations data on which he based his calculations had never been altered, as required, to reflect the increased fuel capacity provided by the added auxiliary tanks—with full tanks the aircraft now held 79 gallons, rather than 60, a difference of about 114 lbs. On a small aircraft a weight overage of 114 lbs. at high altitude in hot weather at high density altitude can be a serious problem.

In this case both the mechanic who installed the aux tanks (and failed to record the alteration in the equipment list and weight and blance report) and the owner (who failed to ascertain that the proper entry had been made) were not in compliance with the regulations.

If the mechanic has pushed the airplane out of the hanger and onto the ramp, it must be ready to go, right? **Wrong!** A maintenance job is never finished until the logbook is signed—and it is the pilot's responsibility to see that it is done before starting the engine.

Periodic Inspections

The maintenance record entries for annual inspections and 100-hour inspections are similar to each other in some respects, but there are some important differences in how the two inspections are handled, specifically when the aircraft fails to pass a given inspection.

ANNUAL INSPECTION: If the aircraft "passes" the annual inspection the mechanic is required to make the following signed and dated entry in the aircraft log:

> "I certify that this aircraft has been inspected in accordance with an annual inspection and was determined to be in airworthy condition."

If the aircraft *does not pass* an annual inspection the mechanic enters the following:

> "I certify that this aircraft has been inspected in accordance with an annual inspection and a list of discrepancies and unairworthy items dated _____ has been provided for the aircraft owner or lessee."

The mechanic provides the discrepancy list to the owner and sends a duplicate copy to the local FAA District Office. The owner may have this work done by a mechanic of his choice—not necessarily the facility where the inspection was performed—and he does not need to go back to the first mechanic for any type of signoff. As soon as all items have been corrected, and the entry made in the records, the aircraft is legal to fly.

100-HOUR INSPECTION: Aircraft that are flown for hire are required to have 100-hour inspections between annuals. Many other aircraft, for which there is no such requirement, are voluntarily put into a 100-hour inspection program in the interest of enhancing safety. (The operations performed during annual inspections and 100-hour inspections are identical, except that it takes a mechanic with an Inspection Authorization to sign off the annual, whereas any mechanic with an Airframe and Powerplant Certificate can sign off a 100-hour inspection.)

When a 100-hour inspection is performed and the aircraft is found to be airworthy, the mechanic makes an entry in the maintenance log similar to that for the annual inspection. However, if the aircraft *does not pass* a 100-hour inspection, the reasons therefore are entered in the service record, and the aircraft may not be flown until it has been reinspected and found to be airworthy. Again, the owner is free to go to another mechanic for necessary repairs, and re-inspection, although this usually is not economical because another mechanic, not familiar with the condition of the aircraft, might have to spend more time examining it than the mechanic who had recently made an inspection of it.

Servicing wheel bearings is on the "preventive maintenance" list, but if done by a mechanic it must be entered in the maintenance records of the aircraft.

The mechanic's signature in the aircraft log is required as a safeguard against a pilot inadvertently flying a nonairworthy aircraft.

ALTIMETER TEST: Many general aviation airplanes are now obligated to have a periodic altimeter test, and there are special record keeping requirements for that. According to FAR 91.170, every airplane which operates in controlled airspace under IFR conditions must have its static pressure systems and altimeter inspected and tested every 24 months according to the directions outlined in Appendix B of Part 43. A record of these tests must then be entered in the records, including the maximum altitude to which the altimeter was tested.

Where to keep the records

The regulations do not dictate where the aircraft maintenance records should be kept, just that they must be made available to FAA or NTSB if requested. Practicality, however, dictates that they should be conveniently located so that the mechanic can review them before he does any work on the airplane, and he can sign them promptly after he finishes. For this reason many private owners do keep their aircraft logbooks in the airplane for ready availability, especially if repairs have to be made out of town. Other owners prefer to keep their records at home in a file. Maintenance records for rental aircraft are frequently kept in the FBO's office, and large operators may have a special department for record-keeping.

Pilot/owners who change air filters (or perform any other preventive maintenance) are not required to make entries in the aircraft logs, but it helps to keep an ongoing record.

What if the records are lost?

Aside from the rules and requirements, common sense dictates that the records be kept in a *safe* place. If they are lost or somehow destroyed, the owner who will have to reconstruct the aircraft history from whatever evidence he can find. Some of the facts that will have to be documented are the total time on the airframe, time since last inspection, time since overhaul of life limited components, a history of all ADs issued for the airplane and its components, and how and when they were complied with, current major alterations, current operating limitations, including weight and balance, etc. Not to be overlooked are dates of the altimeter and static system if the aircraft is flown IFR, and the biennial transponder check.

Chances are this data will have to be gathered in bits and pieces from various sources: the owner's file of paid bills, cancelled checks, correspondence, etc.; the files of those persons he has done business with; placards on the aircraft; pilot's logbooks; maybe even tax returns if the aircraft expenses are deductible. After all the information is together, the owner can set up some new maintenance records, make an entry describing his loss, establish the time in service and other pertinent details and have his signature notarized. It is not an impossible task, but it is tedious, time-consuming—and frequently costly. Those who have had to go this route are the loudest in recommending a secure place for the aircraft logbooks.

Good records mean better maintenance

Besides providing a legal and safe operation for the pilot, well-kept maintenance records have another important purpose: They help the mechanic do a better job. The experienced mechanic who has an opportunity to study the logbooks of an aircraft before working on it has a running start. He knows what has been done to it in the past, what its problems have been, what kind of care it has received. He also knows what is scheduled to be done—now and in the future. Sometimes the logbook entries can give him clues to the source of recurrent problems.

The mechanic may wish to protect himself by keeping copies of all the work he does and records, along with the customer's squawk sheets or work orders. If an aircraft he worked on is involved in an accident and the service logs are destroyed by fire or otherwise not available, he may be asked to provide evidence of what he was asked to do—and what he did—to the airplane when it was in his shop. But owners should never rely on the existence of such shop records, or count on them as a substitute for required service entries.

Buying or selling an aircraft?

One final and convincing argument for keeping complete maintenance records is their significance when an aircraft is being bought or sold. Most well-informed purchasers will ask to see the airplane logbooks, and if they are not complete or understandable the prospective buyer may feel he cannot trust the airplane owners. If he can quickly read over the "medical history" of the aircraft, he is bound to be favorably impressed about its current state of health.

(Further information about aircraft records is contained in FAA's Advisory Circular "Maintenance Records: General Aviation Aircraft" AC 43-9, available free from DOT/FAA Distribution Unit, TAD 443.1, Washington, D.C. 20590. FAA Flight Standards Service has recently released a slide lecture presentation "Aircraft Records," available at GADOs or FSDOs.

A SHORT GLOSSARY OF MAINTENANCE TERMS

"Approve for return to service." What the mechanic does when he signs the aircraft logbook, after repair or alteration.

"Return to service." When the pilot flies the aircraft after it has been repaired or altered.

"Major alteration." An alteration not listed in the aircraft, engine or propeller specifications, that might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics or other qualities affecting airworthiness; or that is not done according to accepted practices, or cannot be done by elementary operations.

"Major repair." A repair that, if improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or that is not done according to accepted practices or cannot be done by elementary operations.

"Minor alteration." Any alteration other than a major alteration.

"Minor repair." Any repair other than a major repair.

"Preventive maintenance." Simple or minor preservation operations or the replacement of small standard parts not involving complex assembly operations.

NOTE: Alterations and repairs that are classed as "major," and items considered "preventive maintenance" are listed in FAR Part 43, Appendix "A."

Keeping Them on the Runway

The unconventional control problems of conventional landing gear

One of the many aircraft to fly into the new airport at Auburn in central California for the dedication ceremonies in September of 1973 was a venerable Stearman biplane with that "conventional" type of tail wheel gear common to pre-World War II aircraft. Approaching Auburn Municipal, the 41 year old pilot entered left traffic for runway 7. The weather was bright and clear, with the wind at about two knots, and the pilot brought the Stearman down smoothly on the main gear. He rolled for about a thousand feet and the tail wheel was on the ground when the airplane swerved to the right. It veered off the runway and, as the spectators in the stands watched helplessly, it slid around out of control in a groundloop over dirt and rocks until it finally hit a ditch and pitched over on its back. Luckily, the pilot was able to climb out with only minor injuries, but his classic airplane was substantially damaged and would require major repairs to both wings and to the propeller.

That groundloop is the most prominent mishap out of the approximately 600 accidents recorded each year in National Transportation Safety Board files involving a "conventional" or tailwheel gear aircraft. Few result in serious injuries, but the potential for tragedy is always present.

There are about 40,000 conventional gear aircraft still capable of being flown in the U.S. today, and many new models are still being built for acrobatics, agricultural application, special use, and generally for flying in and out of unpaved runways. Some of the tail gear aircraft are flown by people who simply like the mystique of "taildragging," the feel of flying as it was done in the pioneer days.

However, quite a number of air taxi or air carrier aircraft still in service are tailwheel planes notably DC-8's and Beech 18's.

Tailwheel aircraft are preferred for rough fields because the tail gear is essentially less vulnerable to ground damage during landings. On the other hand, tail wheels on most light aircraft have limited steerability, or are locked in place. The complete steerability of the nose wheel is a definite ad-

vantage in keeping the aircraft lined up with the runway. There are several other important design factors which contribute to the large number of groundloop accidents involving tailwheel aircraft:

• **Earlier loss of rudder control.** When the tail wheel is on the ground, after landing, the rudder is lower than the nose, and therefore it is less affected by the relative wind than the rudder on a tricycle gear aircraft. This means that the pilot loses rudder effectiveness in directional control somewhat earlier in the taildragger.

• **Visibility.** In many taildraggers the pilot's forward view is more or less obstructed by the cowling when the tail wheel is on the ground. He may have to cock his head to one side to see ahead, and he may, if inexperienced, have more difficulty keeping the aircraft lined up with the runway, both on landing and takeoff. If there is considerable crosswind, and the nose is allowed to move upwind, the stage is set for a groundloop.

• **Braking.** Because a tailwheel airplane is more vulnerable to nosing over, following sharp application of the brakes, the pilot must be more cautious in using the brakes to control the direction of the airplane on the ground. The danger increases as the airspeed or relative wind pressure on the tail, declines. Some tailwheel aircraft are quite susceptible to nosing over when brakes are applied incautiously during taxiing.

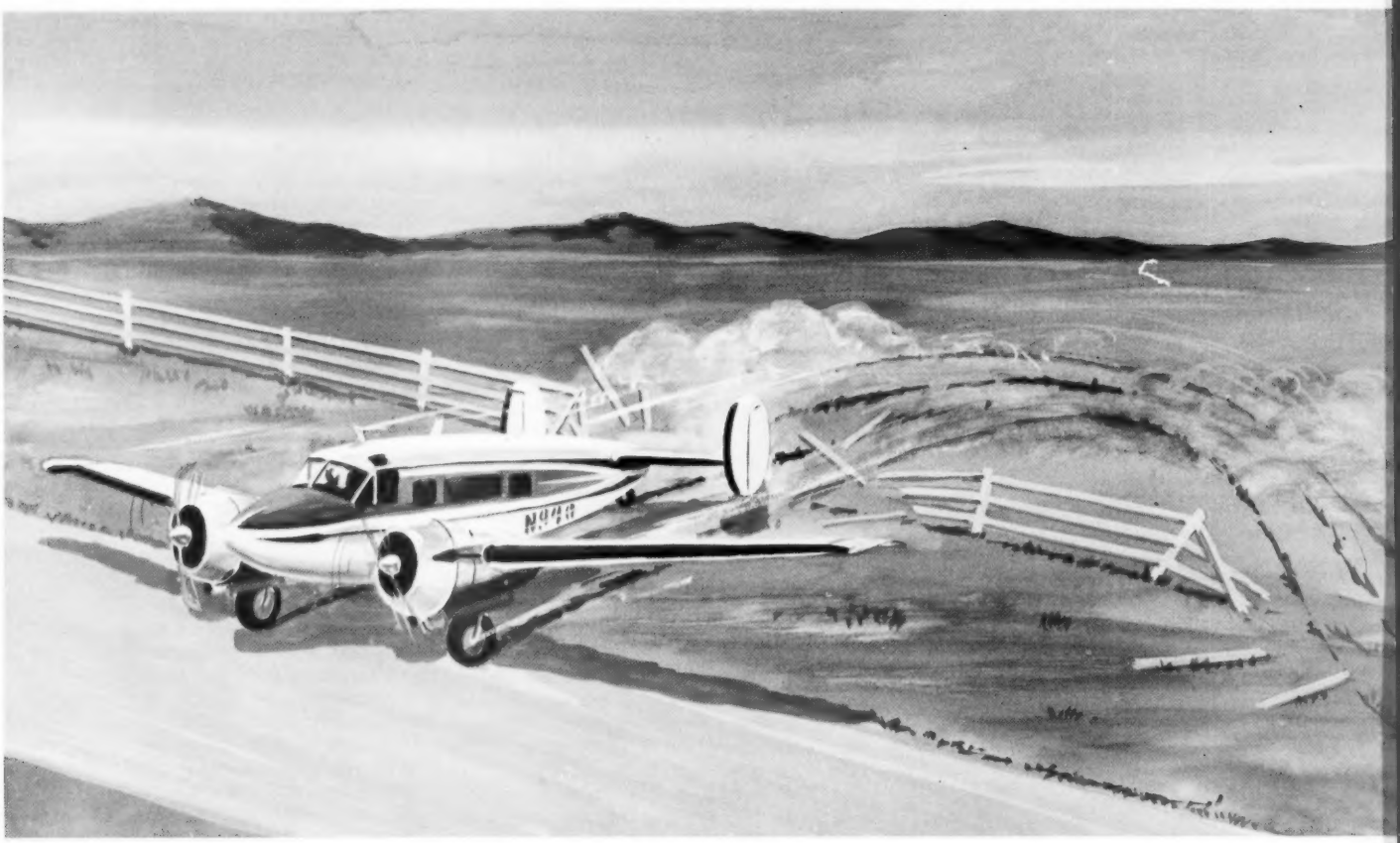
• **Center of gravity.** In a nose wheel aircraft the main wheels are aft of the center of gravity. In a tailwheel airplane the main wheels are *forward* of the C.G., as a matter of necessity to keep the plane from falling on its nose when supported by the landing gear. This makes the taildragger more susceptible to loss of directional control when landing in crosswinds, for two reasons: (1) The distance from the tail to the pivotal point—the main wheels—is relatively greater. The longer this "moment arm," the more sensitive the plane is to lateral pressure.
(2) The inertia of the landing aircraft, which is concentrated at the center of gravity, is directed down the runway and exerts a continuing force in this direction after any swerve has begun. In a taildragger this force will increase the tendency to weathervane or groundloop, because it is located *behind the pivotal point.* (The opposite is true of the nosewheel airplane, where the C.G. inertia tends to realign the airplane with the runway.) See diagrams.

These factors do not make tailwheel aircraft necessarily more difficult to land or take off than tricycle gear planes—under certain conditions they may even handle with less difficulty—but they do have certain different characteristics. Pilots who were trained on tricycle wheel aircraft and have never flown anything else would do well to take some dual instruction before taking off in a taildragger for the first time. The situation is somewhat analogous to the automobile driver who has some 20 years of experience in driving but has never known anything but automatic drive. If he begins his career in a manual shift car in a trafficky area, he is certainly going to have his hands full.

The first problem the pilot new to taildraggers discovers, when he taxis out for the take off, is how difficult it is to maintain a direct course when you cannot see over the nose of the aircraft. This particular problem can be solved by taxiing slowly and zigzagging enough to see ahead, but when the takeoff run is started it is a different matter. For a crucial few seconds, while the engine is running at full blast and torque is high but the airspeed is insufficient to raise the tail or give positive rudder control, you need a guidepoint to keep from straying from the centerline. In strong gusts you may have to use braking for lateral control, and if you overbrake to one side you are quite likely to wind up with a ground loop. Incidentally, the positive angle of attack which exists when the tail wheel is on the ground increases the "P" factor (of the propellor) somewhat, over a comparable nose wheel aircraft which has a zero or negative angle of attack when all three wheels are on the ground.

Experienced taildragger pilots usually line

Drawing a bead on the landscape helps keep you straight on the runway on takeoff, when the cowling blocks your view. Use a visual reference—not an instrument.



Adding power to correct a swerve can pile up a lot of kindling. In this case the right engine, revved up too late to prevent the first penetration of the fence, powered the Beech twin around in a secondary fence-busting loop.

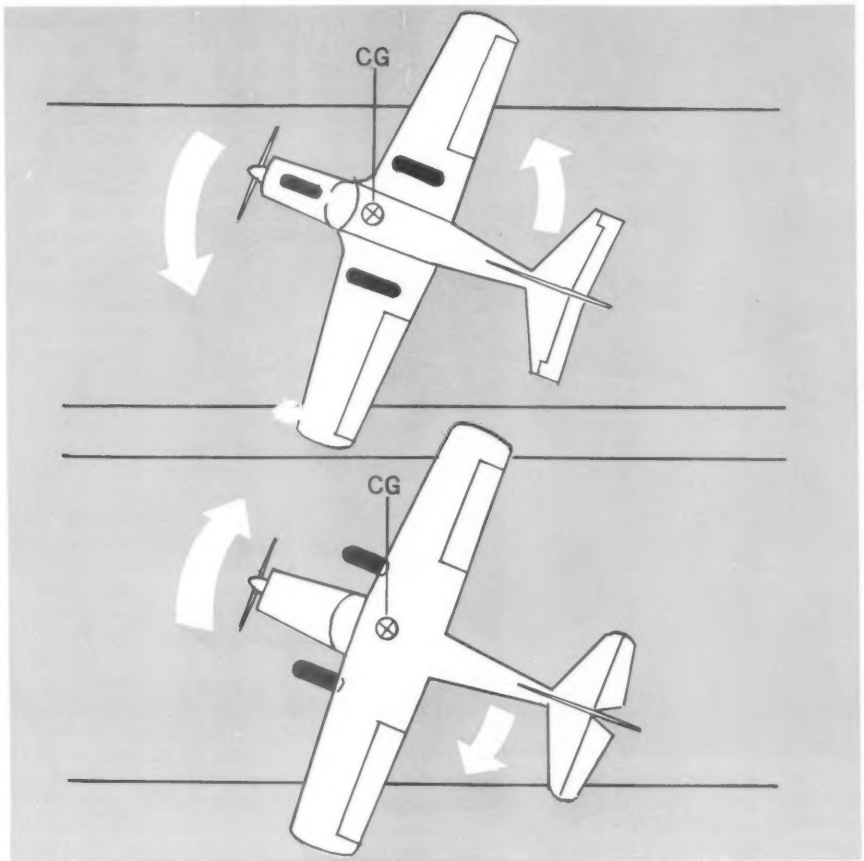
themselves up, before starting the take off run, with some high prominent object directly ahead—such as a tall tree, a hilltop, a large building, etc. If no such object can be seen over the nose of the aircraft, then you must depend on your peripheral vision to maintain an even distance from the runway edge. Some inexperienced pilots simply wait for the nose to drop down low enough so that they can see the runway ahead, but that brief span of time may be enough for the aircraft to run off the runway or swerve beyond recovery. Pushing the wheel forward prematurely to raise the tail can result in weathervaning when the wind is not directly down the runway. If the trim tab is set at neutral, the tail will come up by itself as the airplane gathers speed, with very slight or no forward pressure on the wheel. At this point additional rudder pressure may be needed because of increased torque effect.

Once the tail is up, the takeoff roll may be completed with a slightly positive angle of attack, so that the aircraft lifts off naturally as soon as it picks up flying speed. The transition from ground roll to flight should be smooth but positive, so that the airplane does not settle back or bounce; given the weathervaning susceptibility of a taildragger, this could result in severe strains on the landing gear.

In favorable weather and terrain conditions, light tailwheel aircraft are landed in a full stall configuration, or with the tail eased on to the ground immediately. But quite often taildraggers are operated at makeshift airstrips, frequently ringed with hills or woods with variable and unpredictable wind flow. In severe turbulence, where a *power approach* may be required, the landing must be accomplished on the main wheels with the tail wheel well clear of the runway. In many aircraft this requires very careful timing and control handling to prevent bouncing. The aircraft is held in level flight until the wheels touch; the throttle is then immediately retarded.

The taildragger appears to be most vulnerable at that point in a gusty or crosswind landing when the tail wheel reaches the ground and rudder effect in directional control becomes negligible—airspeed drops off rapidly and there is virtually no prop blast. It is extremely important that the aircraft be lined up true with the centerline. If not, it takes a very sensitive pair of feet on the brakes to avoid swerving off the runway or groundlooping. "Heavy footed" or inexperienced braking can easily lead to a nosing-over. A typical example of this type of accident occurred when a veteran pilot attempted a landing in a homebuilt Pitts *Special* at Flyers Airport at Waterloo, Iowa. The pilot had over 4,000 total hours, but only eight hours in type. It was a short practice flight, and he landed the Pitts smoothly with no difficulty until he was almost at a complete stop near the end of his roll. At this point he applied the brakes —gently, he thought. But the airplane promply nosed over, landing on its back. The pilot later realized that the reason the braking response was so strong was because he had been wearing heavy safety shoes with thick, hard soles, which gave him little sensitivity in that area.

The braking characteristics of tailwheel aircraft vary considerably from one make and model to another. In general, the large planes such as the DC-3 and the Beech 18 have relatively large braking surfaces which may be used to good advantage in slowing the aircraft at the beginning of a landing roll. Once the airspeed, or relative wind, dies down, caution must be exercised to avoid pitching the aircraft over on its nose with the brakes. The nose-over suscepti-



Once a swerve off the runway has begun, the location of the center of gravity aft of the main wheels on the taildragger will reinforce the tendency to groundloop. On tricycle gear planes the inertia of the center of gravity helps re-align it with the runway.

bility will also vary according to the number and location of passengers and cargo on board. The pilot should take time to acquaint himself thoroughly with the braking responsiveness of each taildragger he intends to fly before moving onto the runway.

In contrast to the soft or rough field landing procedure for tricycle gear airplanes, which stresses landing on the main wheels and holding the nose wheel off the ground as long as possible, the taildragger procedure for this type of operation calls for touching down with the tail wheel at the same time or *just before the main wheel touches down*. The tail wheel should be held down throughout the landing roll with the elevators. Performed correctly, this results in a minimal landing roll and less strain on the airplane.

Power is sometimes added during the ground roll if a groundloop or an off-runway crash seems imminent—as a means of raising the tail and regaining rudder response; or, in the case of twin engine taildraggers, to counter the influence of a crosswind. But this must be done judiciously, to avoid compounding the difficulties encountered. By the time the prop revs up enough to affect control, the situation may have altered radically. The attempted cure can be worse than the original difficulty, as was the case in an accident involving a twin Beech D-18 at Raton, N.M. in June of 1974.

The venerable Beech taildragger, operating as an air taxi, had ten persons on board the aircraft that fine morning when it approached La Mesa Airport, a private field south of town, for landing. The pilot was also venerable and experienced, with 4,800 hours in his logbook, but only 70 hours had been flown in tailwheel airplanes. The final approach was made from the north, to land on Runway 17.

The pilot estimated, from the appearance of the windsock, that the wind was light to moderate and blowing from about five degrees to the right, or west, of the runway, which was separated from a farmer's field by a wooden fence. He touched down about 200 feet from the end of the runway and rolled another 200 to 250 feet when "all at once the aircraft turned about 25 degrees to the right."

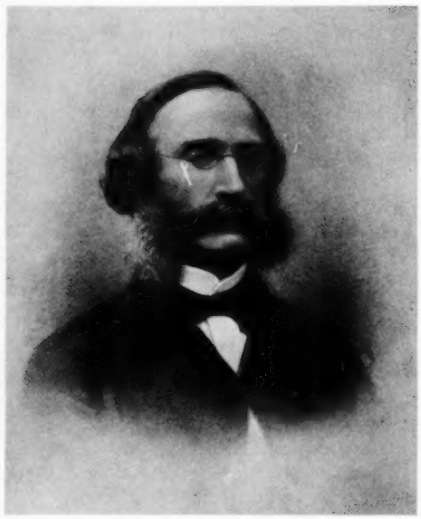
To avoid running into the fence the pilot used left rudder and advanced the throttle on the right engine. Before the engine revved up fully, the plane tore through the fence. As the thrust of the right engine became effective, the Beech swerved in the opposite direction, breaking through the fence again, and finally came to a halt in the grass on the other side of the runway. Fortunately the passengers and crew disembarked without injury.

The Federal Aviation Regulations covering recency of experience (Part 61.57) require pilots in command of tailwheel aircraft carrying passengers to have made at least three *full stop* landings in a tailwheel airplane within the previous 90 days (touch and go landings are acceptable for other types of aircraft). This requirement recognizes the need for a pilot to retain additional skill in directional control during rollout and takeoff in taildraggers.

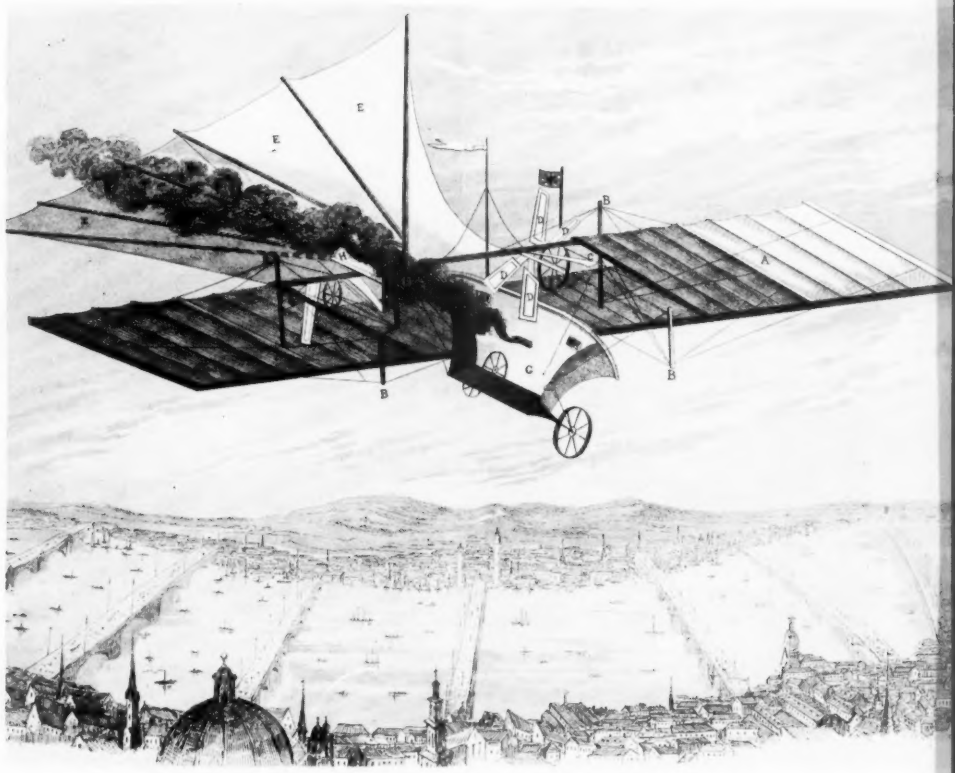
Pilots who "grew up" on tailwheel aircraft seldom, if ever, seem to have any difficulty with them in any phase of flight. The typical candidate for one of the numerous groundloop accidents that happen every year is the pilot who jumps into a taildragger—perhaps a homebuilt model some close friend has poured hundreds of manhours of labor into—and takes off without a proper briefing on the aerodynamics of taildraggers, or some dual time in this type of aircraft. It only takes one ill-timed puff of wind on the landing roll to transform a shining, winged labor of love into a heap of matchwood.

Accidents like this can spoil a lifelong friendship. ■

Some airplanes have a nasty way of teaching you how not to handle a tailwheel landing.



William Samuel Henson



Henson's flying locomotive sailing (in fancy) over London's bridges

The Aerial Steam Transit Company

The announcement that a new air route from England to India was to be inaugurated, with stops en route in the United States and on the continent of Europe, would not attract much attention in 1976. Certain other details of the announcement might appear a bit more remarkable: a 150 foot wingspan, with a wing area of over 4,500 feet . . . twin propellers 20 feet long driven by a newly designed high pressure steam engine. . . .

A *steam* engine? Naturally. The announcement was dated 1842, the heyday of the age of steam, and the "airline" was known as the "Aerial Steam Transit Company." It was conceived of by *William Henson*, an obscure lace maker from the north of England and it dazzled the imaginations of millions of persons around the world, but it flourished, alas, only on paper —largely in the blurbs produced by two enthusiastic publicity men who owned shares in the company formed to sell stock in the enterprise. Steam power had already accomplished so many industrial miracles in the 19th century, especially in England, that people were quite prepared to believe it would conquer every obstacle to trade and social progress. Publication of Henson's patent specification of 1842 evoked such a spate of artist's renderings of aerial "steam carriages" in flight—over London, over Africa, India, and elsewhere—that a bedazzled public was ready to queue up for tickets to tour the world by air in Mr. Henson's conveyance.

William Samuel Henson was born into a family of lace makers of Nottingham, England in 1812. He was apprenticed to the trade at an early age, and soon displayed indications of an inventive mind and a diverse imagination. At age 23 he secured his first patent for a new type of bobbin, and followed this with patents for a razor, a breech-loading cannon, and an ice-making machine, a steam engine, and finally an airplane.

Stimulated by the theoretical work on aerodynamics carried out by Sir George Cayley, Henson concluded that successful flight lacked only a more efficient steam engine than those in common use on land and sea. In point of fact, the steam engine he settled on could not have delivered more than 25 to 30 hp at best, and would never have got his "Locomotive Apparatus for Air, Land and Water" aloft, but on the assumption that it *would* Henson proceeded with the design he patented in 1842, which showed a surprising understanding of many of the aspects of powered flight.

These included propeller thrust (rather than the still currently popular notion of wingflapping), elevator and rudder movement for pitch and lateral control, and landing gear consisting of ". . . three wheels in order that when the car comes to the earth it may run readily without injury, and owing to the great control which the tails offer in governing such a machine . . . the car may be caused to come to the earth in so flat an incline that in taking the earth very little, if any, shock will be perceived by the passengers."

Henson even designed an "Aerial Station" —forerunner of the airport, which provided a control tower and an inclined plane for takeoffs. His belief in the reality of his "Aerial Train' was so infectious that Queen Victoria herself condescended to take note of his patent.

But cautious Britons were reluctant to purchase shares in the Aerial Transit Company without seeing something more tangible than words and pictures.

To bolster flagging public interest, Henson formed a partnership with John Stringfellow, another lace maker "engineer" from Nottingham, to construct several small scale models of his aerial steam carriage. Stringfellow, like Henson, was not an engineer by training but a clever mechanic interested in perfecting the efficiency of light steam engines. Henson's patent had included a proposed new design for the boiler and condenser that, in the words of the contemporary Pictorial Times would . . . "Transform the ponderous steam engine into a

contrivance fitted for traveling the regions of the air. The boiler consists of . . . hollow cones placed around and about the furnace, with the truncated points downward. They are large and numerous enough to present about 100 sq. ft. to the furnace."

Nevertheless he was interested in Stringfellows ideas, and the two men collaborated from 1843 to about 1848. They erected a tent on the Downs near Chard, and after seven weeks of labor produced their first test model—a wood and silk steam-driven aircraft with two four bladed propellers, each three feet in diameter and capable of turning over at 300 rpm.

The model was lovely to behold, according to Stringfellow, but an instant failure. Before the fire under the boiler could even be lighted, a drooping in the wings and a "sagging in all parts" was observed. Within a few moments of being exposed to the foggy, soggy dew on the Downs, the fabric was so impregnated with moisture that a trial flight was out of the question.

Successive trials encountered similar obstacles, even after they were moved indoors. The two men knew about steam engines, but they had no experience and little theoretical knowledge of airframe construction. After five years of struggle, accompanied by caustic comment in the press, Henson gave up in despair. He dissolved his Aerial Transit Company and emigrated to America, where he was said by some to have disappeared." Stringfellow continued to experiment with steam driven models until his death in 1883, claiming occasional successful flights which were never substantiated.

Henson meanwhile settled in Newark and raised seven children, supporting them more or less well as a "consulting engineer" on any subject under the sun. He continued to patent inventions until the day of his death, in 1888, after publishing a modest volume on the mechanics of the universe. He always knew how to think big. ■

One of several models of steam driven aircraft built by Henson and Stringfellow to enlist public support for their project.

ADDRESS CHANGE IN OK CITY. Aircraft owners are advised that FAA has a new address for registering aircraft. From now on documents should be sent to FAA Aircraft Registry, Department of Transportation, P. O. Box 25504, Oklahoma City, Okla. 73125. Hand-carried documents should be delivered to 6400 S. MacArthur Blvd., Oklahoma City.

■ PLANE SENSE. Prospective aircraft purchasers will find a newly revised FAA booklet helpful in learning about the requirements of owning and operating a personal airplane. The publication discusses the documents the owner should receive, explains how to be sure you are getting a clear title, and describes the preparation of the Certificate of Registration and the Bill of Sale (the official papers that transfer ownership). The book also discusses aircraft maintenance, including Airworthiness Directives, and gives locations and phone numbers for FAA District Offices, which prospective owners are urged to visit before buying their first aircraft. Ask for AC 20-5D, "Plane Sense".

FAR EXPORTING AIRCRAFT. The Advisory Circular on "Export Airworthiness Approval Procedures" has been updated by FAA to include several changes in requirements that have been submitted to FAA by foreign governments. The Circular contains guidelines concerning issuance of export approvals under the FARs, lists FAA Regional offices responsible for civil aviation matters in foreign countries and also lists countries with which the United States has concluded agreements for reciprocal acceptance of airworthiness certificates. Ask for AC 21-2C, giving title mentioned above.

BEFORE YOU JUMP. A revised Advisory Circular "Listing of FAA Certificated Parachute Lofts" (AC 149-2H) provides the current name and location of approved lofts. The list is alphabetical by state, and coded for ratings. Also new is the revised "FAA Designated Parachute Rigger Examiner Directory" (AC 183-31C). A designated parachute rigger examiner may accept applications for and conduct both oral and practical tests as required for issuing parachute rigger certificates.

EVALUATING HELICOPTER FATIGUE. Procedures for evaluating fatigue in rotorcraft structures are outlined in a new FAA advisory circular. Included are sections on flight strain measurement program, frequency of loading, fatigue strength evaluation and fail-safe strength evaluation. "Fatigue Evaluation of Rotorcraft Structure" (AC 20-95) is available free from address below.

Unless otherwise noted, Advisory Circulars mentioned in this column are available free from FAA/DOT Distribution Unit, TAD 443.1, Washington D. C. 20590.

New Rule Broadens Role of Helicopter in Firefighting

A recent FAR amendment permits helicopters operating under FAR Part 133 (Rotorcraft External Load Operations) to dump water on forest fires without complying with the requirements for agricultural operations (Part 137) as was formerly required. The rule change was enacted as the result of a petition from the Helicopter Association of America.

In announcing the amendment FAA said it believes that dispensing water from an aerial conveyance (see photo) is a procedure which external load operators are qualified to carry out safely by virtue of the training and other requirements of Part 133. FAA did not, however, approve the dispensing of fire retardant chemicals in the amendment because the latter requires a knowledge of the handling and dispensing of chemicals similar to that required in agricultural operations.

The new rule is expected to provide relief to a number of areas which are not easily reached by surface firefighting equipment and where no other water-dispensing aircraft are readily available.

Twenty Stations Added to Flight Watch Network

Twenty Flight Service Stations have been added to the original four which offer En Route Flight Advisory Service (EFAS), also referred to as "Flight Watch". By early 1977 the entire 44-station network (plus peripheral communications outlets) is expected to be completed. At that time any pilot flying at 5,000 feet or above in the adjacent 48 states should be able to contact the service, which operates on a single frequency, 122.0 MHz, at all locations.

Flight watch service is designed to provide pilots timely en route weather information including immediate weather conditions (not limited to hourly observations) and the location of thunderstorms or other hazardous weather as reported by pilots or observed on weather radar. For increased effectiveness of the service pilots are encouraged to make frequent pilot reports, particularly of weather conditions encountered in flight between surface weather reporting points. By monitoring the frequency during flight pilots will often be able to keep up with changing weather conditions.

Flight watch service has been in operation in three states on the west coast for several years. During this time weather-related aircraft accident rates decreased in those three states while increasing in the remainder of the country.

To use the service a pilot should contact a flight watch facility on 122.0 MHz, using the name of the controlling FSS ("Boston Flight Watch") or, if the FSS is unknown simply call "Flight Watch" and give the aircraft position relative to the nearest VOR.

Flight Service Stations offering flight watch service (including the four original stations which are starred) are listed below. Current list of such stations will be carried in AIM, Part 3.

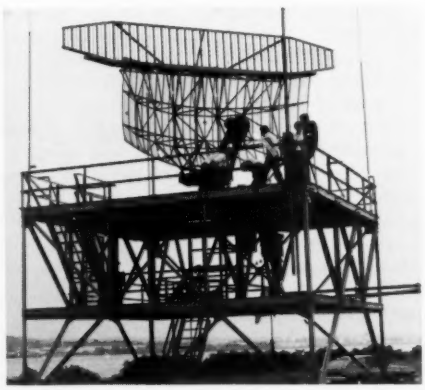
Atlanta	*Los Angeles
Boston	Memphis
Buffalo	Miami
Charleston, S.C.	Montpelier, Vt.
Charleston, W. Va.	*Oakland
Chicago	Pittsburgh
Denver	*Portland, O.
Detroit	Raleigh, N.C.
Houston	*Seattle
Huron, S.D.	St. Louis
Indianapolis	Teterboro
Kansas City	Washington, D.C.

Guidelines Issued for Compliance With Hazardous Material Rule

A new FAA Advisory Circular has been published to assist air carriers and air taxi/commercial operators in complying with the training program and operations manual requirements of the revised hazardous materials rules. A recent FAR change, which incorporates FAR 103 (the old hazardous materials rules) into Title 49, Part 175 of the Code of Federal Regulations, may require these certificate holders to revise their manuals and training programs as they pertain to carrying hazardous items. (In order to carry certain hazardous materials as cargo, a commercial operator must have developed an approved program for handling the items and also for training any employees who have a responsibility in such handling.)

Included in the circular are paragraphs on such subjects as acceptance, storage and loading of hazardous material for air shipment; written notification of pilot-in-command when such items are on board his flight; reporting of certain hazardous materials incidents; damage to hazardous materials packages; special requirements for poisons; suggested curriculum for training of personnel.

Copies of AC 121-21, "Information Guide for Training Programs and Manual Requirements in the Air Transportation of Hazardous Materials" may be obtained from DOT/FAA Distribution Unit, TAD 443.1, Washington, D.C. 20590.



THE BETTER TO SEE YOU. A new "open array" radar beacon antenna recently installed at Washington National Airport is resulting in greatly improved signals from aircraft transponders and fewer false targets than were obtained with the older design. Better performance is due to the larger top-to-bottom dimension of the new antenna (four feet vs. 19 inches for the older unit). The Washington antenna is the first installation of what is projected to become the standard type of terminal radar beacon antenna. Nine more units will be delivered by the end of the year and an additional 150 antennas of this type will be ordered subsequently.

• The Girl in the Photo

Hey, that's me! The picture of the girl sitting in the co-pilot's seat on page 13, August 1976 FAA GENERAL AVIATION NEWS. Where'd you ever get my picture? Would you please advise if it's me or not, because if it isn't (and I'd bet my SMEL it is) I've got a flying twin up there someplace!!

Susan S. Simon
Lafayette Hill, Pa.

Your "twin" in the photo is Gail Gorski, a professional FAA pilot at Washington National Airport who is checking out another agency pilot in a Bonanza. *You may keep your SMEL (Single and Multi-Engine Land certification).*

• Change of Address

Will you *please* change my address on your mailing list? A few months ago I moved. Shortly afterward when writing a letter on another matter I gave you my new address, but I am still not getting any issues of FAA GENERAL AVIATION NEWS. Most of my other mail was forwarded, but not your magazine.

B. C. Johnson
Philadelphia, Pa.

Proper procedure for changing your address is to pick up from your post office a change of address card (PS Form 3578) designed for magazine subscriptions. Paste a copy of your old mailing label in the designated space, add your new address, and mail to MAIL LIST SECTION, GPO, Washington, D.C. 20402. DO NOT SEND TO FAA, since we do not *handle the distribution of the magazine. Note that third class mail (as our magazine is sent)* is not *forwarded unless you specifically direct that the post office do so, in which case you must agree to pay the postage.*

• Sump Secrets

Your "Engine Doctor" feature on "The Secrets of the Sump" in May was excellent, but I think even more emphasis on the need for surgical cleanliness during oil sampling is in order. The lady who wondered about the sterilized container should rest assured that she is not being put on. In fact "surgical" cleanliness is really not clean enough for oil sampling (or other internal engine operations). The human body can stand a lot more dirt in it than an engine, whose working surfaces are easily scored by grit, and such damage is certainly not self-healing. Moreover, since oil analysis can detect less than one part per million of impurities, contamination of the oil sample must be avoided for the sake of accuracy.

I have found oil analysis very helpful in the care of my Beech *Baron* and quite accurate in its findings. Some of the precautions we take in sampling include sweeping the hangar the day before; never taking oil samples outdoors or where there is a draft that might create dust; cleaning the quick-drain valves of the engine before-hand; using special oil-resistant tubes that are used for nothing else, and storing these tubes in a sealed container between oil changes; taking oil sample in the midst of the oil draining, rather than at the beginning; taking samples as quickly as possible and sealing the container immediately after. I find that the peace of mind and low maintenance costs amply justify the trouble and (very moderate) expense of scrupulously clean sampling.

Dean S. Edmonds, Jr.
Associate Physics Professor
Boston University.

• Dear Engine Doctor:

I have an occasional engine problem on a Cessna 150 that I fly. When starting the takeoff roll following a touch and go landing I get a brief RPM loss—down to about 1,600 RPMs—and severe roughness for perhaps 15 seconds. The condition seems to be worse when landing in a no-flap, full stall configuration, with the nose high and a long holdoff. On the other hand there is no problem during full stop, or stop and go landings. A & P's have checked this engine several times and can find nothing wrong. It seems to me some type of fuel starvation is occurring—or maybe the wrong size fuel lines were installed. What do you think? Also, what should a pilot do when the mechanic cannot solve a problem like this?

Edward A. Sobolik
Cicero, Ill.

Suggest that you talk to an FAA maintenance inspector at the nearest Flight Standards District Office (GADO or FSDO). If that is not convenient, contact the Customer Service Department of the manufacturer of the aircraft or of the engine for advice.

• Reverse Discrimination?

When I returned home after helping direct the 29th Power Puff Derby and finally had time to read the many news articles on the race, I was horrified to find statements alluding to a lack of cooperation from FAA as one reason for the termination of the annual Derby. *Nothing* could be farther from the truth. The Race Board has always enjoyed exceptionally good cooperation from local, regional, and national offices of FAA.

The reason given for the alleged lack of cooperation from FAA was our refusal to allow men to compete in the Powder Puff Derby! Believe me, there is no basis for any of the above. Without the support of FAA we could not have had a race, and we thank you all again!

Betty Wharton
Vice Chairman, Powder Puff Derby
San Diego, Calif.

• Weather Briefing Forms

In a recent article on "How to Get a Better Weather Briefing" you mentioned two forms to use for the purpose, FAA Form 8000-20 and the "Flight Planner." Can you send me copies or tell me where I can get copies of these forms?

Robert C. Doban
Toledo, Ohio

The FAA Form 8000-20 and the Flight Planner" are not distributed from FAA Headquarters but only through the FAA Accident Prevention Program, primarily at safety seminars. If it is impossible for you to attend such a seminar, contact the Accident Prevention Specialist at your nearest FAA Flight Standards District Office (GADO or FSDO) who might have copies on hand.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

• Nick-Fixing

The article "Nick-Knocked Props" in June was an excellent bit of information for the general aviation pilot. However, the article stated that minor repairs can be done by a qualified mechanic—which is certainly true—but where does the mechanic get his information to do a proper repair? AC 43.13-1A, which covers acceptable methods for aircraft repair, is difficult to understand and does not always agree with the information in the manufacturer's service manuals. The FAA powerplant handbook, AC 65-12, does not say anything about repairs to aluminum propeller blades. As Chief Inspector of Aviation Mechanics at a Vocational-Technical Institute, I would like to see an advisory circular that would clearly define repair procedures and limits for mechanics to follow when "dressing out" a propeller blade.

Donald Schoonhoven
Thief River Falls, Minn.

There is an eight page section on the repair of metal propellers in AC 43.13-1A, complete with a number of diagrams. Mechanics who do not understand this or other maintenance information should contact an airworthiness inspector at the FAA District Office (GADO or FSDO) for help. Incidentally, when it comes to propeller repair, the information in the propeller manufacturer's service manual takes precedent over any other information *(including that in the AC mentioned).*

INSTRUMENT CORNER

• Canadian Holding Patterns

My Canadian approach plates and en route charts do not show any holding patterns (sometimes called "shuttle patterns" north of the border). What does a pilot do if it is necessary to hold in Canadian airspace?

James M. Thoburn
Rochester, N.Y.

Holding patterns for civil airports within Canada are not published. Instructions for holding are included in the "holding clearance" issued by ATC, which includes at least: (a) Clearance to the holding fix; (b) Direction to hold from the holding fix; (c) On specified radial, course, inbound track; (d) An altitude of flight level; (e) If DME is used, the DME distances at which fix end and outbound turns are to be commenced, and (f) Time to expect further clearance, time to expect approach clearance, or time to leave the fix in the event of communications failure.

Complete details may be found in a Canadian publication GPH 204 "Flight Planning and Procedures", available from Canada Map Office, Department of Energy, Mines and Resources, 615 Booth St., Ottawa, KIA OE9. Price is $2.00 per single copy, $4.00 per yearly subscription (two copies per year).

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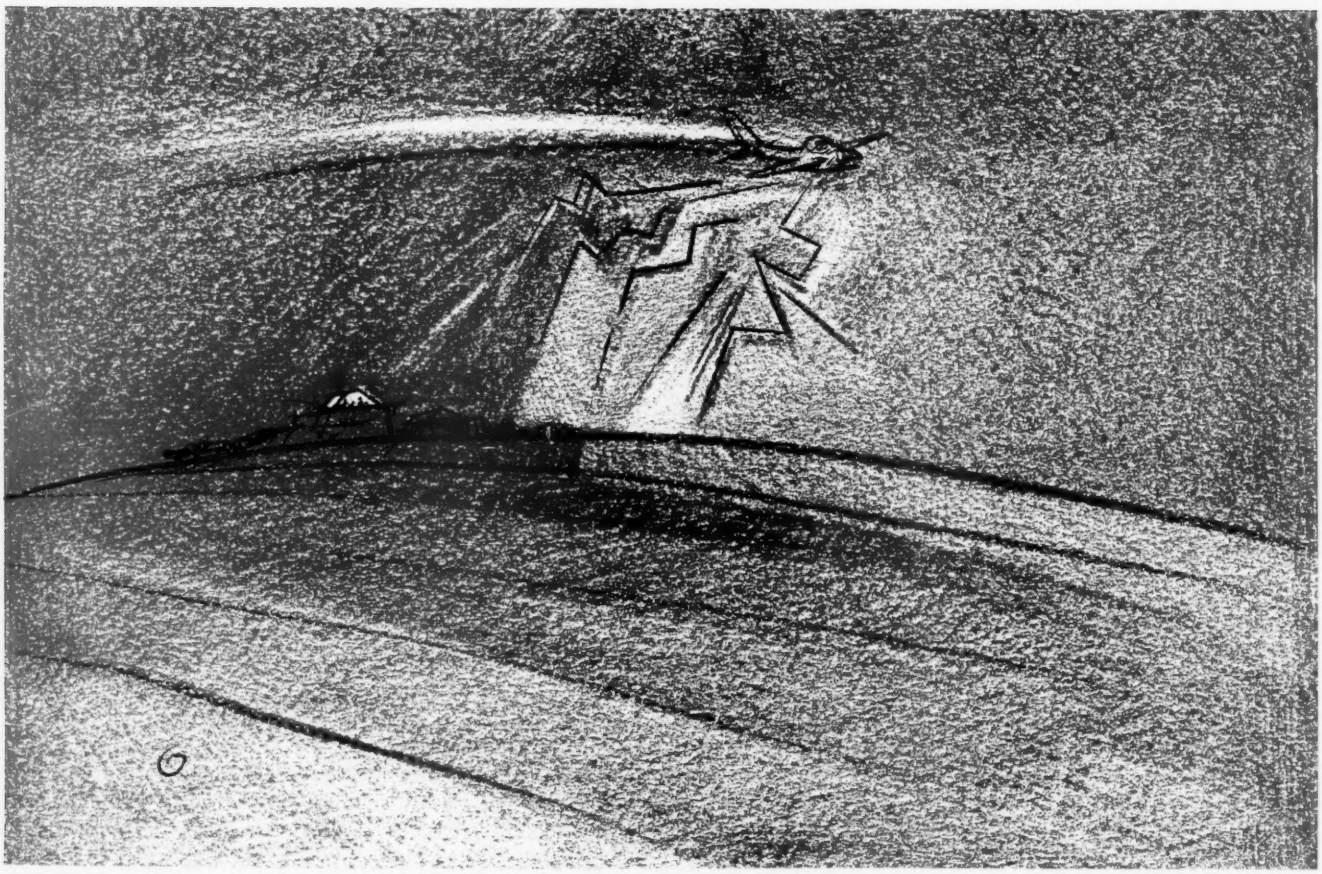
If the field looks dim, why risk a limb?



Request the tower to turn up the power

Idea suggested by A. C. Taviana, Kansas City ATC